Prove by induction that for all \( n \geq 1 \)

\[
\frac{0}{1!} + \frac{1}{2!} + \cdots + \frac{n-1}{n!} = 1 - \frac{1}{n!}
\]

Base case is \( n = 1 \). Sum is first term, namely \( \frac{0}{1!} = 0 \).

Formula gives \( 1 - \frac{1}{1!} = 0 \).

So LHS = RHS

Assume true for \( n = k \). Test for \( n = k + 1 \).

Sum through \( k \) terms is sum through \( k - 1 \) terms plus final term.

Thus

\[
\text{LHS} = \left( \frac{0}{1!} + \frac{1}{2!} + \cdots + \frac{k-1}{k!} \right) + \frac{k}{(k+1)!} = 1 - \frac{1}{k!} + \frac{k}{(k+1)!} = 1 - \frac{1}{(k+1)!} = \text{RHS}
\]